

The Action characterizes Humphrey as disclosing a blend of polyvinylidene fluoride (PVDF) and polymethyl methacrylate (PMMA), wherein PVDF is a known crystalline polymer, and PMMA is a known amorphous polymer. Supercritical carbon dioxide is a blowing agent for forming open cell foams. The Action concedes that Humphrey fails to disclose "making porous foamed materials having a plurality of distinct voids." The Action at page 4. However, the Action states that:

[t]he reference does suggest that closed-cell porous foams and foams having both open and closed cells may be formed by the invention (col. 4 lines 53-57), noting that the mobility of electrolyte is increased with an open structure. One skilled in the art would recognize that including amounts of closed cells in the foams would provide a means for controlling the mobility of electrolyte. It is thus the examiner's position that it would have been *prima facie* obvious to provide closed cells within the porous structure to control the mobility of the electrolyte and this control the conductivity of the system.

*Id.* Humphrey is applied against all of the rejected claims on this basis.

In response, Applicants respectfully direct the Examiner's attention to the Declaration of Joseph R. Royer (the Royer Declaration), a copy of which is submitted concurrently herewith. The Royer Declaration discusses the processing methods described in Humphrey as being appropriate for the polymeric electrodes and battery separators disclosed therein. More specifically, the Royer Declaration identifies three methods disclosed in Humphrey for generating a foam structure for a PVDF electrode. *See* the Royer Declaration at para. 4. The first, a "solvent and non-solvent combination method", produces a foam that has (a) cells that are "asymmetric", (b) a thick skin, and (c) a remaining core that is porous and offers little resistance to flow. *Id.* The Royer Declaration states that these foams are open-celled foams, and states that "by the chemical nature of the solvent-non-solvent process closed cell foam cannot be achieved." *Id.* The other two methods described in Humphrey are clearly directed to open cell foam. *Id.* at para. 5. The Royer Declaration concludes that "the methods used in Humphrey cannot be used to generate closed-cell foam," and states that the declarant is "not aware of any manner known in the current art to produce a closed-cell foam of a PVDF

material as recited in the claims of the present application other than what is described in the present application."

Based on the content of the Royer Declaration, Applicants respectfully submit that the position taken in the Action no longer stands. More specifically, even if a *prima facie* showing of obviousness had been made in the Action (which Applicants do not concede), the Royer Declaration clearly refutes that showing by demonstrating that the methods disclosed in Humphrey cannot produce a closed-cell foam. Inasmuch as all of the claims include a recitation that is directed to a closed-cell foam (i.e. that there are a "plurality of distinct void spaces" in the foamed material produced by the method), Applicants respectfully request that the rejections based on Humphrey alone be withdrawn.

Applicants further submit that the secondary references do not overcome the deficiencies of Humphrey. Pecsok is cited only for the extrusion of PVDF polymers in a nozzle in which the polymer and additives are mixed in the mixing section of the extruder and melt blended. Boutillier is cited for the use of liquid CO<sub>2</sub> as a foaming agent for vinyl monomers. Minakata is cited for the disclosure of an organic blowing agent. None of these references suggests any modification to Humphrey that would enable any process disclosed therein to produce a closed-cell foam.

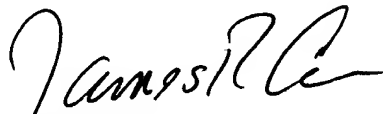
In view of the foregoing, Applicants respectfully submit that one of ordinary skill in this art would not have conceived the subject matter of the pending claims based on the teachings of the cited references. As such, Applicants respectfully request that the rejections under Section 103(a) be withdrawn.

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**III. Conclusion**

Applicants respectfully request entry of this Amendment and allowance of the present application. The Examiner is encouraged to direct any questions regarding the foregoing to the undersigned, who may be reached at (919) 854-1400.

Respectfully submitted,

  
James R. Cannon  
Registration No. 35,839



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**CERTIFICATE OF MAILING**

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Washington, DC 20231, on March 24, 2003.

Joyce Paoli



**Version with Markings to Indicate Changes**

Please amend the following claims as indicated.

145. (amended) A method of producing a foamed material, said method comprising:  
contacting a mixture of thermoplastic polymers consisting [essentially] of PVDF and PMMA, wherein the mixture of thermoplastic materials is amorphous; and  
subjecting the mixture to conditions sufficient to create a thermodynamic instability in the mixture to foam the mixture, wherein the foamed material formed by said method has a plurality of distinct void spaces formed therein having an average size ranging from about 0.1 to about 50 microns.

148. (amended) A method of extrusion processing a mixture of thermoplastic materials, said process comprising:  
introducing a mixture of thermoplastic polymers consisting [essentially] of PVDF and PMMA into an extruder barrel, wherein the mixture of thermoplastic materials is amorphous;  
heating the mixture of thermoplastic materials to provide a molten blend thereof;  
contacting the molten blend of thermoplastic materials with a blowing agent; and  
subjecting the blend to conditions sufficient to create a thermodynamic instability in the blend to foam the blend, wherein the foamed blend has a percent crystallinity lower than the first thermoplastic polymer;  
wherein the foamed material formed by said method has a plurality of distinct void spaces formed therein having an average size ranging from about 0.1 to about 50 microns.